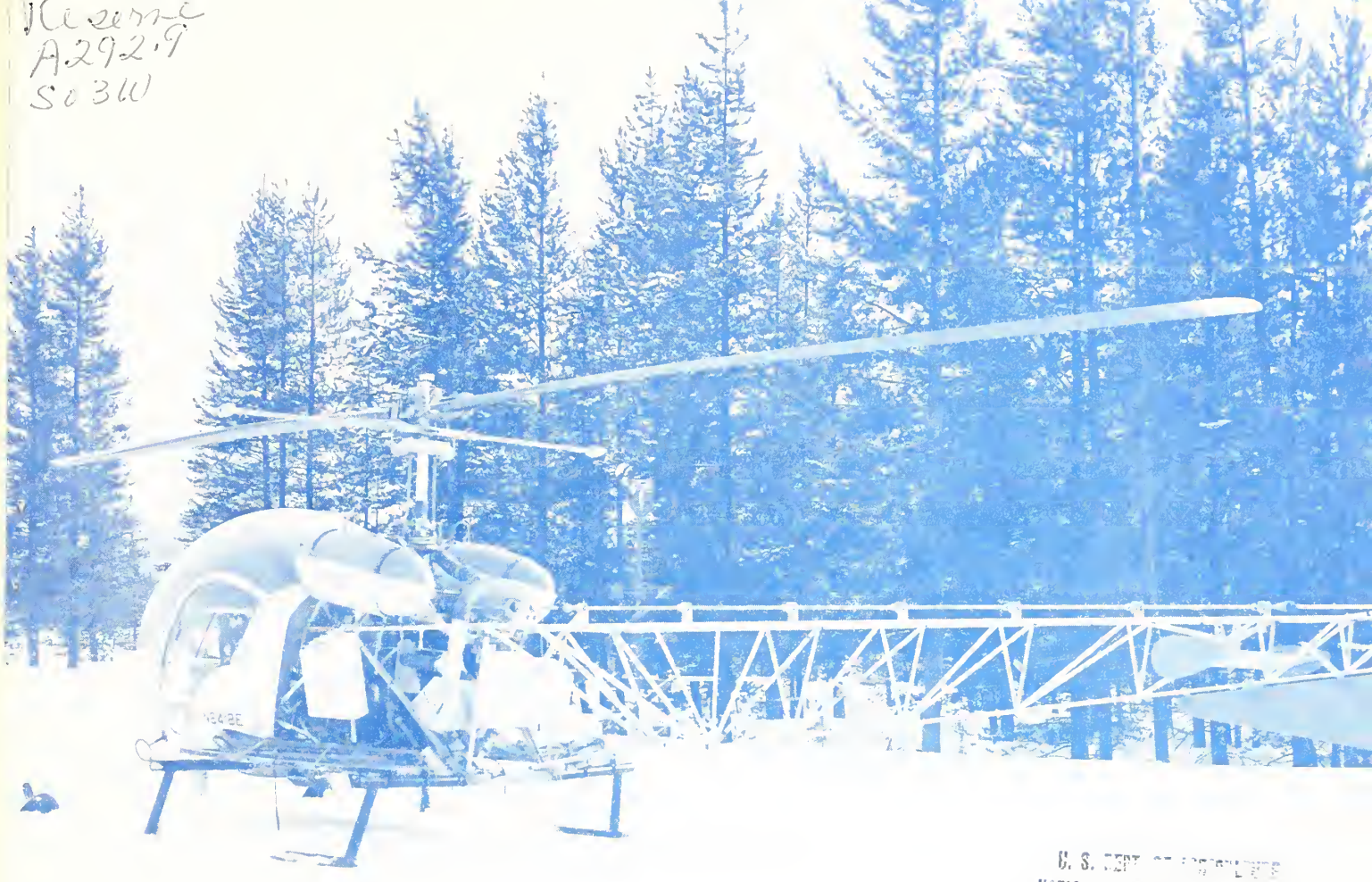


WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAR. 1, 1965

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Soil Conservation Service, 511 N.W. Broadway - Room 507, Portland, Oregon 97209.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
BASIC DATA SUMMARY	OCTOBER 1	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RESOURCES SERVICE, DEPT. OF LANDS, FOREST AND WATER RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

ISSUED

MARCH 1, 1965

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Surveys Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR

APRIL - SEPTEMBER, 1965
PROSPECTIVE STREAMFLOW
As of March 1, 1965

WATER SUPPLY OUTLOOK

As of March 1, 1965

WATER SUPPLY OUTLOOK REMAINS FAVORABLE WEST-WIDE FOR 1965. EXCESSIVE SNOWPACKS EXIST ON SNAKE RIVER WATERSHED IN SOUTHERN IDAHO. SNOWFALL IN WEST COAST STATES DEFICIENT DURING FEBRUARY REDUCING STREAMFLOW FORECASTS.

Climatic conditions during the mid-winter of 1964-65 were characterized by heavy precipitation and snowfall in all areas of the mountain west. Record or near record floods occurred in December and January in parts of Oregon and California. Above average streamflow has been the general rule west of the Continental Divide.

February snowfall tended to be near average along the Continental Divide and extremely deficient in west coast states. Seasonal snow accumulation to date ranges generally near 125 percent of average with near average snowpack in the Washington and Oregon Cascades and in the northern and southern Sierras of California. Somewhat higher snowpack has accumulated in the central Sierras.

Heaviest snowpack now exists on the Snake River and adjacent watersheds in Idaho, Wyoming, Utah and Montana where 150 percent of average is typical for many watersheds. On the tributaries to the Snake in western Idaho spring runoff will be excessive.

If late season snowfall should be deficient there could be limited shortages on the South Platte and Arkansas in Colorado, the Rio Grande in Colorado and New Mexico, and Sevier and Virgin rivers in Utah. Streamflow in these areas will be near or above average, but carryover storage is extremely short.

If late season snowfall follows the usual pattern, streamflow is expected to be above average for the first time since 1957 on the main stem of the Colorado, the Arkansas and the Rio Grande. More streamflow than forecast would be welcome to provide for summer demands and improve reservoir levels to more favorable operating conditions.

Even with a relatively favorable outlook, surface flow will not be adequate to meet all water demands in central Arizona or areas in California where local requirements always exceed the available supply.

The flow of the Missouri and its tributaries for 1965 is expected to be well above average in Montana and Wyoming and at downstream stations on the main stem of the Missouri. Flow forecasts tend to be up from a month ago.

There was a small decline in forecasts for the main Columbia during February, but snowmelt season flow will probably exceed that for any year since 1956. Streamflow during the winter months has been excessive. Snowpack ranges near average for the Canadian section of the basin, in Washington state and along the Cascades of Oregon. Heavy snow cover remains along the Continental Divide in Montana, Idaho and Wyoming, including the Boise and adjacent watersheds in Idaho and the mountain areas of eastern Oregon. Runoff forecasts for the western Idaho area are very high, and reservoirs are near capacity even with attempts to lower them. Excess water during the runoff season will be difficult to control in these local areas. Because of heavy winter runoff, carryover storage is well above average in the Columbia Basin, especially in irrigation reservoirs.

The California Department of Water Resources reports that even if February snowfall in the state was deficient, water supply outlook remains good to excellent for the northern and central sections of the state. Another season of scant local runoff is anticipated for southern California. Snowpack is near average on the upper Sacramento and on watersheds south of the San Joaquin in the Central Valley. On central Sierra streams snowpack is about 125 percent of average for this date. Winter streamflow has been good and reservoir storage is near average with adjustments after the winter floods in the past two months. Streamflow forecasts follow the pattern of the present snowpack.

As usual, the amount of snow accumulation for the spring months will have considerable effect on summer streamflow.

MISSOURI BASIN

Water supply outlook is good throughout the basin except that the carryover is less than average on the North and South Platte. Near record snowpack has accumulated on the headwater tributaries of the Missouri and Yellowstone -- near 150 percent of average for March 1. Snow cover ranges down to about 120 percent of average on the North and South Platte.

If snowfall for the remainder of the season is near average, high seasonal flows comparable to those of a year ago are expected. Peak flow will probably not be as high on some of the northern tributaries because heavy June rains such as occurred last year during snowmelt should not be anticipated.

MONTANA

East of the Divide, snow cover on the headwaters of the Missouri and Yellowstone is roughly 150 percent of average and a year ago on this date. With favorable carryover storage irrigation water supplies are assured for all sections of the state. There is little question that some high water will be experienced during spring runoff. The magnitude will depend on snow accumulation during the spring season and principally temperature and precipitation sequences during the snowmelt period. Extreme departures from average as occurred last snowmelt season are not likely to occur again this year. However, total seasonal flow of the Missouri through the state may exceed any of the past 30 years.

WYOMING

The pattern of excessive snow accumulation continued during February along and near the Continental Divide in western Wyoming on the headwaters of the Green and Wind rivers and the Salt river tributary to the Snake. The snowpack to date is near 150 percent of average. The above average snowpack extends to the Bighorn range and to a lesser degree to the North Platte. The only detracting factor is below average carryover storage in the North Platte system. With reasonable increases in snowpack during the spring months water supplies should be adequate.

COLORADO

Water supply for the South Platte area will be fair to good depending on snowfall for the remainder of the season. Carryover storage, while less favorable than a year ago, will still provide a substantial supplement to summer runoff. Streamflow forecasts on tributary streams are now from 110 to 120 percent of average.

ARKANSAS BASIN

For the first time in four or more years, mountain snowpack is above average on the headwaters of the Arkansas and its tributaries in Colorado and New Mexico. A continuation of the mid-winter snow accumulation pattern is needed to assure a good water supply for next year. Several years of near drouth conditions have depleted storage and tends to increase demands. Valley soils are dry.

RIO GRANDE BASIN

Snow cover on the Rio Grande in Colorado is the best in the state at 140 percent of average but somewhat short of that for this date in 1952. Water supply outlook is comparable to the most recent above average years of 1957 and 1958. Storage in San Luis Valley is much less than normal.

Even if the flow of the Rio Grande through New Mexico is expected to be well above average, adequate water supplies are by no means assured. Normal demands always exceed the average supply. Further, reservoir storage is at a low stage, comparable to recent years on the Rio Grande. Storage on the Pecos and Canadian is also low in respect to average and to the last few years. More snowpack is desirable to supply the demands of next summer as well as to improve reservoir storage.

COLORADO BASIN

The trend to above average prospective streamflow extends generally to the Colorado River Basin; although a few local areas of Utah and Arizona may experience water shortages. The forecast for Inflow to Lake Powell is 117 percent of average, equal to the total seasonal flow for 1963 and 1964. Overall storage in the Colorado River system is slightly below average and less than half of total capacity, but a bit more than for a year ago on this date.

COLORADO

West of the Continental Divide snowpack is about 125 percent of normal representing a slight improvement over a month ago. Highest snowpack is on the San Juan and Dolores rivers and in the western section of the state away from the Continental Divide. Water supplies will be adequate to meet local needs along the principal tributaries.

UTAH

Snowpack along the Great Basin-Colorado Divide in central Utah has declined in relation to average during the past two months but remains heavy as a result of storms before the first of the year. Streamflow forecasts for the snowmelt season are for about 125 percent of average flow. Water supplies for local needs should be adequate.

For the Green River originating in Wyoming, snowpack is the highest in the Colorado Basin for a major sub-watershed.

ARIZONA

The water supply outlook for most of Arizona is good. Reservoir storage is above average and streamflow generally is expected to exceed average. The exceptions are the upper Gila Valley and the San Carlos project which may expect less than average water supplies.

All reservoirs have above average storage except Lake Pleasant. Winter streamflow has been high except for the Gila. Pumping will be required for the San Carlos project.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS MARCH 1, 1965

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	157	149
Madison	178	150
Gallatin	150	158
Missouri Main Stem	135	134
Yellowstone	155	153
Shoshone	156	126
Wind	170	130
North Platte	144	120
South Platte	195	120
ARKANSAS BASIN		
Arkansas	208	134
Canadian	163	133
RIO GRANDE BASIN		
Rio Grande (Colo.)	308	134
Rio Grande above Otowi Bridge	275	134
Pecos	194	196
COLORADO BASIN		
Green (Wyo.)	208	161
Yampa - White	171	127
Duchesne	295	124
Price	342	130
Upper Colorado	181	112
Gunnison	150	113
San Juan	292	128
Dolores	250	135
Virgin	286	85
Gila	400	120
Salt	310	116
GREAT BASIN		
Bear	188	140
Logan	183	141
Ogden	163	115
Weber	220	139
Provo - Utah Lake	198	115
Jordan	219	139
Sevier	222	104
Walker - Carson	230	140
Tahoe - Truckee	190	130
Humboldt	101	89
Lake Co. (Oregon)	113	98
Harney Basin (Oregon)	118	112
UPPER COLUMBIA BASIN		
Columbia (Canada)	92	98
Kootenai	110	117
Clark Fork	130	127
Bitterroot	129	126
Flathead	142	131
Spokane	112	106
Okanogan	98	110
Methow	91	100
Chelan	83	87
Wenatchee	94	110

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	174	135
Snake above Hiese, Idaho	165	137
Snake above American Falls Res	164	142
Henry's Fork	136	143
Southern Idaho Tributaries	151	133
Big and Little Wood	225	175
Boise	193	161
Owyhee	104	109
Payette	190	144
Malheur	117	122
Weiser	185	153
Burnt	130	130
Powder	157	135
Salmon	186	155
Grande Ronde	139	139
Clearwater	115	108
LOWER COLUMBIA BASIN		
Yakima	104	107
Umatilla	102	124
John Day	143	133
Deschutes - Crooked	124	111
Hood	102	110
Willamette	105	104
Lewis	116	121
Cowlitz	114	107
PACIFIC COASTAL BASIN		
Puget Sound	120	98
Olympic Peninsula	90	84
Umpqua - Rogue	115	113
Klamath	111	111
Trinity	90	85
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	175	105
Feather	155	110
Yuba	185	110
American	200	120
Mokelumne	220	120
Stanislaus	220	120
Tuolumne	220	120
Merced	240	120
San Joaquin	260	115
Kings	220	100
Kaweah	220	100
Tule	185	75
Kern	270	95

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1948-62 period.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

SELECTED STREAMFLOW FORECASTS — APRIL-SEPTEMBER — MARCH 1, 1965

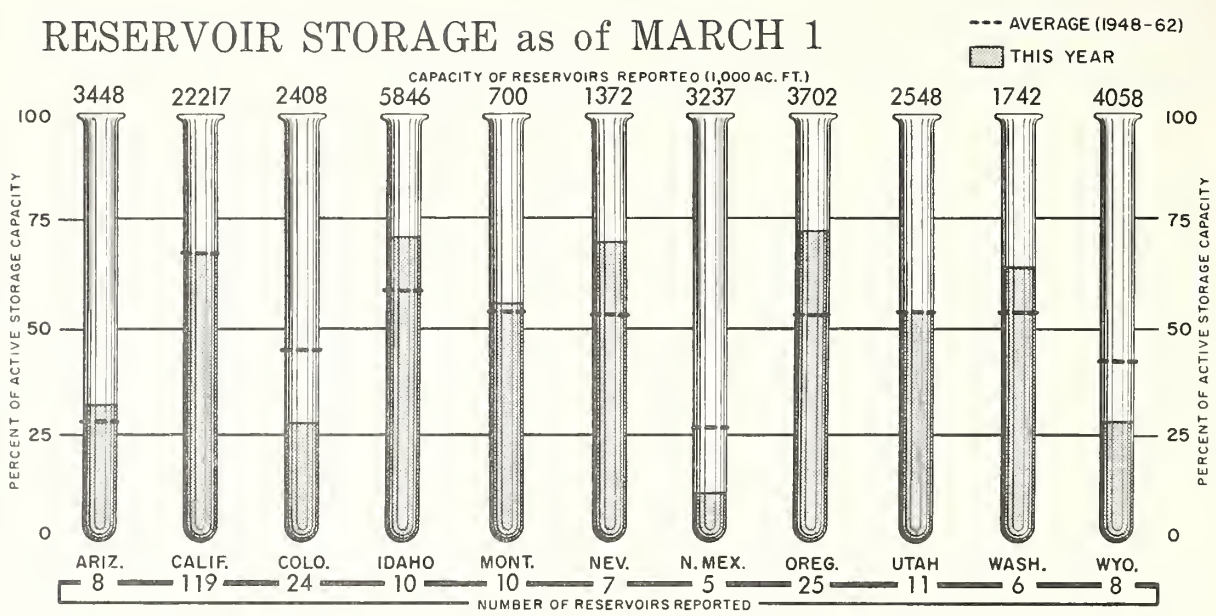
STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1964	FORECAST 1965	
UPPER MISSOURI			
Clark Fork at Chance, Montana	602	700	120
Gallatin near Gateway, Montana	551	570	127
Jefferson at Sappington, Montana	1294	1260	130
Madison near Grayling, Montana 1/	474	510	121
Missouri near Zortman, Montana 2/	6697	5700	126
Missouri near Williston, N. Dakota 3/	13999	14700	133
Yellowstone at Corwin Springs, Montana	2128	2320	123
Yellowstone at Miles City, Montana		7800	135
Shoshone below Buffalo Bill Res., Wyoming 4/		990	123
Wind at Dubois, Wyoming		136	136
PLATTE			
Clear at Golden, Colorado 5/		156	116
North Platte at Saratoga, Wyoming		790	123
Cache LaPoudre near Ft. Collins, Colorado 6/		280	114
ARKANSAS			
Arkansas at Salida, Colorado 7/		387	120
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/		655	133
Rio Grande at Otowi Bridge, New Mexico 9/		950	156
Pecos at Pecos, New Mexico *		85	160
UPPER COLORADO			
Animas at Durango, Colorado		545	120
Colorado at Glenwood Springs, Colorado 10/		1890	121
Colorado near Cisco, Utah	2525	5000	133
Colorado, Inflow to Lake Powell, Arizona**	5483	9300	117
Duchesne near Tabiona, Utah 12/		155	136
Green, Inflow to Flaming Gorge Res., Utah**	1180	1350	120
Green near Green River, Utah 13/	2875	4300	128
Gunnison near Grand Junction, Colorado		1550	119
Price near Scofield, Utah 14/	33	47	125
San Juan near Bluff, Utah 15/	644	1500	128
White at Meeker, Colorado		415	125
Yampa at Steamboat Springs, Colorado		375	128
LOWER COLORADO			
Gila near Solomon, Arizona (Mar-May)	17	65	83
Salt at Intake, Arizona (Mar-May)	93	316	139
Verde above Horseshoe Dam, Arizona (Mar-May)	90	120	106
GREAT BASIN			
Bear at Harer, Idaho 16/	289	460	178
Logan near Logan, Utah 17/	123	195	147
Ogden, Inflow to Pine View Res., Utah 18/ (Mar-July)	115	166	129
Provo at Vivian Park, Utah 19/		200	139
Sevier at Hatch, Utah 20/	35	38	85
Sevier near Kingston, Utah	12	17	68
Humboldt at Palisades, Nevada **	271	225	130
Truckee at Farad, California ** 21/	180	345	128
West Walker near Coleville, California **	86	200	143

Forecasts in California provided by Department of Water Resources.
Average is for 1948-62 period except California. California is computed for 1908-57 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER MARCH 1, 1965

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1964	FORECAST 1965	
UPPER COLUMBIA			
Bitterroot near Darby, Montana	730	750	129
Chelan at Chelan, Washington 22/		1350	100
Clark Fork above Missoula, Montana	2130	2340	127
Clark Fork at Whitehorse Rapids, Montana 23/		17500	122
Columbia at Revelstoke, British Columbia	20880		
Columbia at Birchbank, British Columbia 24/	45222	44100	98
Columbia at Grand Coulee, Washington 24/	70253	73050	104
Columbia at The Dalles, Oregon 24/	108696	122500	113
Flathead near Polson, Montana 23/	8553	9380	120
Kootenai at Wardner, British Columbia	4728		
Kootenai at Leonia, Idaho	9037	9636	103
Okanogan near Tonasket, Washington		1900	97
Spokane at Post Falls, Idaho 25/	3836	3750	110
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/	169	270	184
Big Wood, Inflow to Magic Res., Idaho 27/	245	480	181
Boise above Diversion Dam, Idaho 28/	1564	2600	159
Clearwater at Spalding, Idaho	10920	11200	122
Malheur near Drewsey, Oregon		130	158
Owyhee Res. Net Inflow, Oregon 18/	523	460	121
Payette near Horseshoe Bend, Idaho 29/	1757	2700	136
Salmon at Whitebird, Idaho	7438	10000	143
Snake near Heise, Idaho 30/	4634	4800	124
Snake at Weiser, Idaho		9000	130
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington		3250	110
Deschutes at Benham Falls, Oregon 31/		700	111
Grande Ronde near LaGrande, Oregon	155	248	122
Hood near Hood River, Oregon 32/		420	110
Willamette at Salem, Oregon 33/		5800	104
Yakima near Parker, Washington 34/		2095	104
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington		179	101
Rogue at Raygold near Central Point, Oregon		1050	105
Klamath Lake, Net Inflow, Oregon 35/	415	784	123
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.	912	1620	117
Feather near Oroville, Calif.	1165	2100	108
Kaweah near Three Rivers, Calif. 37/	163	280	106
Kern near Bakersfield, Calif.	183	390	90
Kings, Inflow to Pine Flat Res., Calif.	615	1175	100
Merced, Inflow to Exchequer Res., Calif.	310	660	106
Mokelumne, Inflow to Pardee Res., Calif.	309	600	125
Sacramento, Inflow to Shasta Res., Calif.	1183	1800	101
San Joaquin, Inflow to Friant Res., Calif.	643	1215	100
Stanislaus, Inflow to Melones Res., Calif.	432	860	117
Tule, Inflow to Success Res., Calif.	33	45	80
Tuolumne, Inflow to Don Pedro Res., Calif.	743	1370	113
Yuba at Smartville, Calif.	767	1080	96

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period*



GREAT BASIN

UTAH

Snowfall has been light during the past two months in all of Utah. For the northern half of the state snowpack remains heavy at high elevations but near average at lower mountain elevations. Streamflow forecasts are high, many in excess of 150 percent of average in the Salt Lake area and northward. However, the lack of recent snowfall has relieved to some degree the threat of excessive water during snowmelt that existed a month or so ago. Snowpack is about two-thirds of that of the last heavy runoff year of 1952. The lack of snowfall has reduced water supply prospects in southern Utah, where on many small streams the outlook is considered as only fair.

NEVADA

The irrigation water supply in western and northern Nevada is good to excellent. Snowpack in this area ranges from 90 percent of average in some tributaries to the Humboldt and Owyhee to near 150 percent of average on the east slope of Sierra streams. In east central Nevada snowpack is near average with less in the mountains to the south near Las Vegas reservoir storage is 130 percent of the March 1 average, state-wide. February snowfall tended to be deficient but this is offset by storms earlier in the winter.

COLUMBIA BASIN

The United States section of the Columbia Basin along with adjacent areas in Oregon, California and Nevada had extremely heavy precipitation during December and January. In the warmer areas near the coast much of the precipitation was rainfall. Along with low elevation snowmelt, this rainfall caused heavy runoff and general flooding. In the interior of the basin the storms brought heavy snow accumulation to western Montana and Wyoming, and south central Idaho and eastern Oregon. This pattern continued generally during February. Increase in snow cover was slightly less than average near the Continental Divide while there was a general lack of precipitation in the Cascade Mountains of Oregon and Washington. As of March 1 snowpack ranges from near average in the western part of the basin to typically 140 to 150 percent of average in Montana, Idaho, Wyoming and eastern Oregon.

At this time the forecast for the Columbia at The Dalles is 122,000,000 acre feet for the April-September 1965 period as compared to 106,000,000 in 1964 and 131,000,000 in the high runoff year of 1956. Much of the excess flow will come from the Snake River watershed.

BRITISH COLUMBIA

The Water Resources Service of British Columbia reports that snow measurements tend to be above average in the southeastern part of the Province on March 1. The northern section of the Columbia watershed has above average snowpack at lower elevations and near average at the higher elevations. Streamflow is expected to be about average for the snowmelt season starting in April.

MONTANA

West of the Divide snowpack is near a maximum of record for this date at many high elevation snow courses in the Flathead, Clark Fork and Bitterroot drainages. On the Kootenai, snowpack is only slightly above average.

STORAGE IN LARGE RESERVOIRS MARCH 1, 1965

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	296
Buffalo Bill	380	143
Canyon Ferry	2043	1763
Hebgen	385	221
Tiber	1316	671
Belle Fourche	185	130
Keyhole	190	120
Fort Peck	19105	15220
Fort Randall	6100	3712
Garrison	24500	13566
Oahe	23600	9759
PLATTE		
Glendo	786	343
Pathfinder	1011	111
Seminoe	982	160
Colo-Big Thompson (4)	865	304
ARKANSAS		
Conchas	370	101
John Martin	367	3
RIO GRANDE		
Elephant Butte	2207	155
El Vado	194	2
UPPER COLORADO		
Flaming Gorge	3789	826
Navajo	1709	265
Powell	28040	6223
LOWER COLORADO		
Havusu	619	517
Mead	27209	11361
Mohave	1810	1683
San Carlos	1206	75
Salt River Res. (4)	1755	800
Verde River Res. (2)	322	105
GREAT BASIN		
Bear	1421	927
Lahontan	286	236
Rye Patch	179	139
Sevier Bridge	236	51
Strawberry	270	64
Tahoe	732	486
Utah	1149	444

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	286
Coeur d'Alene	238	175
Flathead	1791	1143
Hungry Horse	2982	2370
Kootenay	673	491
Pend Oreille	1155	908
Roosevelt	5232	3038
LOWER COLUMBIA		
Detroit	300	108
Hills Creek	249	68
Lookout Point	337	103
Yakima Res. (5)	1066	800
SNAKE		
American Falls	1700	1261
Arrowrock	287	260
Anderson Ranch	423	279
Brownlee	1427	734
Cascade	653	353
Jackson	847	556
Lucky Peak	278	48
Palisades	1202	789
Owyhee	715	625
PACIFIC COASTAL		
Clear Lake	440	272
Upper Klamath	584	484
Ross	1203	886
Trinity (Clair Engle Lake)	2500	2167
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	742
Berryessa	1602	1596
Cachuma	205	136
Casitas	254	40
Cherry Valley	268	111
Don Pedro	290	188
Folsom	1010	554
Hetch-Hetchy	360	184
Isabella	570	124
McClure	281	260
Millerton	521	339
Nacimiento	350	160
Pardee	210	182
Pine Flat	1013	537
Shasta	4500	3271

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

Streamflow forecasts range from 120 to 130 percent of average except for the Kootenai where near average flows are expected. On Clark Fork tributaries, forecasts are among the high 10 percent of record flows.

IDAHO

Snow cover remains critically high on the Big and Little Lost, Big and Little Wood, Boise, Payette and Weiser rivers in Idaho, with only slightly less in respect to average on the Upper Snake and Salmon rivers. February snowfall in these areas tended to be less than average, but fall and mid-winter precipitation was extremely high leaving heavy snowpacks and wet soils both at mountain and valley elevations. The heavy snowpacks extended to foothill elevations. Storage capacity normally available to help control snowmelt flows is being emptied, but water in storage remains well above average.

The volume of flow represented in the snowpack will produce some degree of damaging flows in local areas during the snowmelt season.

Northern Idaho has a near normal snowpack largely because much of the winter precipitation has come as rainfall.

OREGON

Water supply outlook in Oregon is excellent. Snowpack is far in excess of average in eastern Oregon and near average in the Cascade range. Mountain soils are wet. Streamflow for the past three months has been high, continuing through a relatively dry February. Forecasts for eastern Oregon streams for the snowmelt season range from 130 to 150 percent of average. Near average flow is forecast for streams of western Oregon on both sides of the Cascade Mountains.

Reservoir storage is 170 percent of March 1, 1964 state-wide, even with releases in anticipation of heavy runoff on some streams.

WASHINGTON

Water supply outlook for irrigation and power in Washington is good for this time of year. Snowpack is near to above average over the state with a few small exceptions. The mountain soils are wet and the existing snowpack has been ripened by rainfall along with snow during the winter months. February precipitation was below average except for the northeast slope of the Cascades. Water in storage for irrigation and power is generally above average. Reservoirs will fill early during the snowmelt period.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasts in California, reports that as of March 1, the prospects in California are for a good to excellent water supply in northern California with southern California again looking to another season of scant local runoff. Although below normal precipitation during February throughout California caused some curtailment in the amounts of forecasted water supply as reported one month ago, normal reservoir storage and a good snowpack in the upper snow zone sustained the optimistic outlook for northern and central California.

During the past month, there were only three mild storms over California, which contributed only 20 percent of the normal precipitation expected during February. Although not as dry, this February was quite similar to that of one year ago. A firmly entrenched and persistent pattern of high pressure over the eastern Pacific Ocean effectively diverted approaching storms to the north. The overall effect was the occurrence of above normal temperatures in the mountainous areas with humidity substantially lower throughout the state. In southern California, Santa Ana winds caused dry conditions during the middle of the month.

The distribution of precipitation in California during February ranged from a low of 15 percent of normal in the Lahontan and South Coastal areas to a high of 30 percent of normal in the extreme North Coastal area and a small portion of the Central Sierras. In the Central Valley precipitation averaged 20 percent of normal during the month, with precipitation in individual drainage basins ranging from a high of 30 percent of normal for the Tuolumne River to a low of 15 percent for the Kern River. Precipitation for the state as a whole is 120 percent of normal for the water year to date, mostly as a result of the flood producing storms during December and January.

Reflecting the pattern of these earlier storms, the distribution was 140 percent of normal in the North Coastal area, while south of the Tehachapis only 50 percent of normal precipitation has been received to date. The precipitation pattern varied from 160 percent of normal for the American River basin to 130 percent of normal for the Pit River basin in the north and 105 percent of normal for the Kern River basin in the south Central Valley.

Dispite the below normal precipitation during February, streamflow remained relatively high in those areas where the snowpack is the main contributor to spring runoff, primarily due to unseasonable early snowmelt from lower elevations. Runoff from streams tributary to the Central Valley averaged 85 percent of nor-

mal for the month. February streamflow from individual river basins in the Central Valley ranged from a low of 63 percent of normal for the Upper Sacramento River to a high of 132 percent of normal for the Mokelumne River.

The snowpack water content for the state is 110 percent of March 1 average. In the Sierra Nevada, the March 1 water content for most snow courses is still near that of the average for April 1, the date maximum snowpack is considered to be obtained. Forecasts of runoff for the April 1-July 31 period based upon March 1 snowpack and assuming normal precipitation during the remainder of the season, varied from high of 125 percent of normal for the Mokelumne River to a low of 80 percent of normal for the Tule River in the south. The Inflow to Shasta Reservoir in the northern portion of the Central Valley is forecasted to be normal for the April-July period.

Measurements of snowpack were made at 173 snow courses and 117 aerial snow depth markers throughout the state on or about March 1. The elevation of the effective snowline on March 1 was about 4000 feet in northern Sierra and Cascade basins, 5000 feet in the central Sierras, and 7000 feet in the southern Sierras.

Based on March 1 storage values for 119 reservoirs which have a combined useable capacity of over 22,200,000 acre feet, the aggregate storage in California reservoirs is slightly above normal for this date. This represents a net increase of 1,350,000 acre feet of water in storage over last year at this date.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado, and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes, and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes tunnels and Ewing, Fremont, Wurtz, and Columbine ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande, and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge and Big Sandy reservoirs. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park, and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow.

21/ Observed flow exclusive of Lake Tahoe and adjusted for change in storage in Boca Reservoir. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse reservoirs. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay, Hungry Horse, Flathead, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, Noxon, and Brownlee; and pumping from F.D.R. Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch, and Arrowrock reservoirs. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood reservoirs. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elum, Bumping, and Tieton reservoirs, plus diversions by Rosa, New Reservation, Old Reservation, and Sunnyside canals. 35/ Flow records provided by PP&L and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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